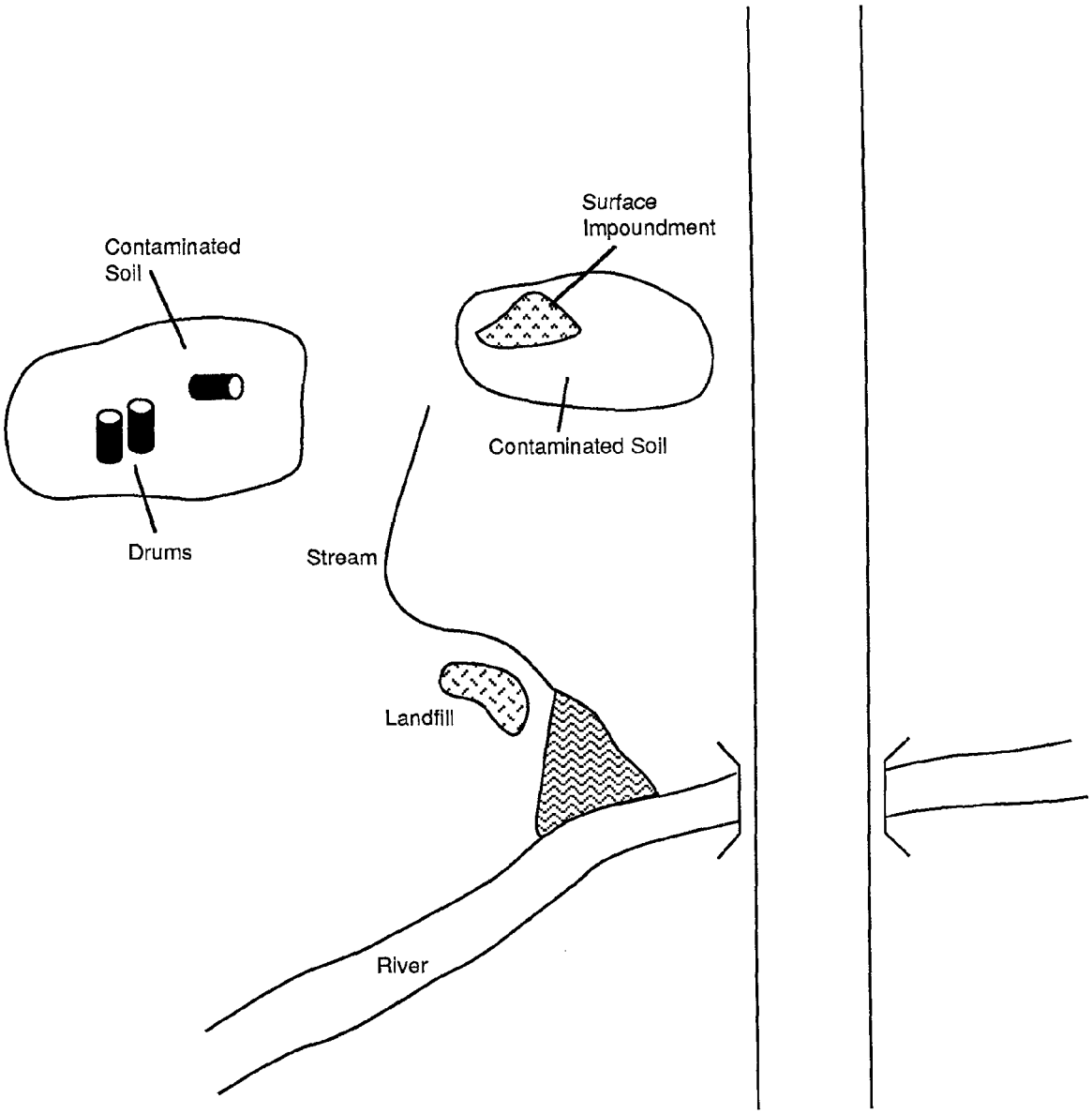
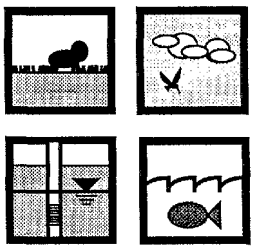
CHAPTER 4
SOURCES



SECTION 4.1 CHARACTERIZATION OF SOURCES AND AREAS OF OBSERVED CONTAMINATION



This section provides guidance to assist the scorer in characterizing sources and areas of observed contamination by assigning factor values based on source type. Because source information is used throughout the HRS and deficiencies in that information or in its interpretation may have a significant impact on the site score, it is critical to correctly classify and characterize each source. This section defines sources (and areas of observed contamination), provides pathway-specific guidance for identifying and documenting sources and their hazardous substances, and discusses special cases where characterizing sources (or areas of observed contamination) is especially complex. This section does not discuss multiple-source sites.

RELEVANT HRS SECTIONS

Section 2.1.3	Common evaluations
Section 2.2	Characterize sources
Section 2.2.1	Identify sources
Section 2.2.2	Identify hazardous substances associated with a source
Section 2.2.3	Identify hazardous substances available to a pathway
Section 5.0.1	General considerations (soil exposure)

DEFINITIONS

Area of Observed Contamination: Evaluated only in the soil exposure pathway and established based on sampling locations as follows:

- Generally, for contaminated soil, consider the sampling locations that indicate observed contamination and the area lying between such locations to be an area of observed contamination, unless information indicates otherwise.

- For sources other than contaminated soil, if any sample taken from the source indicates observed contamination, consider the entire source to be an area of observed contamination.

If an area of observed contamination (or a portion of such an area) is covered by a permanent, or otherwise maintained, essentially impenetrable material (e.g., asphalt), exclude the covered area from the area of observed contamination. However, asphalt or other impenetrable materials contaminated by site-related hazardous substances may be considered areas of observed contamination.

Hazardous Substances: CERCLA hazardous substances and pollutants or contaminants as defined in CERCLA sections 101 (14) and 101 (33), except as otherwise specifically noted in the HRS.

Source: Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that may have become contaminated from hazardous substance migration. In general, however, the volumes of air, ground water, surface water, and surface water sediments that may have become contaminated through migration are not considered sources.

Unallocated Source: Not an HRS source type, rather a means of including within the hazardous waste quantity factor those hazardous substances or hazardous waste streams that are known to be at the site but that cannot be allocated to any specific source. Thus, the term only applies for hazardous waste quantity.

The following definitions are for specific source types evaluated in the HRS.

Above-ground Tank: Any tank that does not meet the definition of a below-ground tank (including any tank that is only partially below the surface).

Active Fire Area: Area presently burning or smoldering.

Below-ground Tank: A tank with its entire surface area below the surface and not visible; however, a fraction of its associated piping may be above the surface.

Buried/Backfilled Surface Impoundment: A surface impoundment that has been completely covered with soil or other cover material after the final deposition of waste materials.

Burn Pit: An uncovered area on the land surface that is not presently burning but that was at one time used to burn hazardous substances or was otherwise significantly inflamed.

Container or Tank: A stationary device constructed primarily of nonearthen materials (such as wood, concrete, steel, or plastic) used to contain an accumulation of a hazardous substance; or a portable device in which a hazardous substance is stored or otherwise handled.

Contaminated Soil (excluding land treatment): Soil onto which available evidence indicates a hazardous substance was spilled, spread, disposed, or deposited.

Drum: A type of container used to hold hazardous substances. For HRS purposes, drums are standard 55-gallon cylindrical containers.

Landfarm/Land Treatment: A method of waste management in which either liquid wastes or sludges are spread over land and tilled or liquids are injected at shallow depths into soils.

Landfill: An engineered (by excavation or construction) or natural hole in the ground into which wastes have been disposed of by backfilling or by contemporaneous deposition of soil and wastes.

Other: A source type used when defined source types do not apply. Examples include: contaminated buildings, storm drains, dry wells, injection wells, and French drains. "Other" also can be used for ground water plumes and sediments with no identified source.

Piles:

Chemical Waste Pile: A pile consisting primarily of discarded chemical products (whether marketable or not), by-products, radioactive wastes, or used or unused feedstocks.

Other: A term reserved for a pile of indeterminate origin that contains hazardous substances.

Scrap Metal or Junk Pile: A pile consisting primarily of scrap metal or discarded durable goods such as appliances, automobiles, auto parts, or batteries, that contain or have contained hazardous substances.

Tailings Pile: A pile consisting primarily of any combination of overburden from a mining operation and tailings from a mineral mining, beneficiation, or processing operation.

Trash Pile: A pile consisting primarily of paper, garbage, or discarded nondurable goods that contain or have contained hazardous substances.

Surface Impoundment: A topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of deposition; depression may be dry if deposited liquid has evaporated, volatilized or leached; structures that may be more specifically described as lagoon, pond, aeration pit, settling pond, tailings pond, sludge pit, etc.; also a surface impoundment that has been covered with soil after the final deposition of waste materials (i.e., buried or backfilled).

EVALUATING SOURCES

Evaluating sources consists of five steps: (1) identifying the sources and areas of observed contamination, (2) classifying the source type, (3) identifying the hazardous substances associated with each source or area of observed contamination, (4) evaluating the containment associated with each source, and (5) calculating the hazardous waste quantity for each source. A complete source characterization should include:

- Narrative summary describing the source or area of observed contamination;
- Reference location for the source or area of observed contamination on the site map;
- List of hazardous substances associated with the source or area of observed contamination;
- Containment description; and
- Hazardous waste quantity evaluation.

This section outlines the general strategy for evaluating sources. The order in which topics are discussed here does not imply that any one action is always taken before another. At some sites, the source may be identified and the evaluation will include identifying hazardous substances present in the source and the containment for that source; at others, the hazardous substances may be found in a media and then traced to sources.

(1) **Identify sources and areas of observed contamination.** Locate all sources and areas of observed contamination at the site. For sources readily seen, the scorer can move directly to Step (2). Sources not readily seen can be identified by several methods including (but not limited to):

- Visual observation of geographic or other site features followed by sampling
- Site records indicating historical disposal areas
- Discovery during the Sl

- Aerial photographs showing historical evidence of a source
- Statements by individuals who have knowledge of the site.

Another method to identify sources is through the presence of hazardous substances. In this method, first identify hazardous substances through sampling and then define the source based on the sampling location or trace back from the sampling location to identify the source of the migration. This process may become complicated at sites with more than one source or hazardous substance.

(2) **Classify source type.** After identifying sources at the site, classify each source in one of the HRS source type categories identified for that pathway. If the source classification is unclear, consult ***Highlight 4-1*** and the subsection below, Characterizing Unique Sources.

(3) **Identify hazardous substances associated with sources.** After identifying and classifying the sources at a site, the next step in the characterization process is identifying the hazardous substances associated with each source. The basic methods for identifying hazardous substances associated with a source include:

- Labels, manifests, or other historical records;
- Site operations (e.g., if a plating facility uses trichloroethylene and disposes sludge into a surface impoundment, the scorer could assume trichloroethylene was present in the surface impoundment); and
- Sampling.

HIGHLIGHT 4-1
COMMONLY CONFUSED SOURCE TYPES

At times, it Is difficult to categorize a source at a facility as one particular HRS source. In some cases, the scorer must use professional judgment and knowledge of the waste management practices at the site to assign a source type. The following can help the scorer differentiate commonly confused source types.

Landfill: Landfills are generally characterized by the addition of fill (e.g., soil) during or after disposal, covering the wastes from view. Often, landfills are dug out In the ground and then the soil from the resulting pit is used as fill during disposal. Sometimes, open pits (e.g., old quarries) are used and soil is brought in as cover.

Pile: Piles are characterized by periodic addition of wastes to stacks resulting in one large pile. Piles may occur in a pit, liquid impoundment, or on the land surface. Piles differ from landfills because the wastes generally are not mixed with fill during disposal. Piles in liquid impoundments differ from surface impoundments because the wastes (e.g., often slurries) are deposited with the intention of dewatering the waste and accumulating a large pile of wastes in one area.

Surface Impoundment: Surface impoundments are distinguished by two characteristics - the waste management unit is intended to contain liquid wastes and lacks a soil cover. If the liquid has evaporated, the waste management unit should still be considered a surface Impoundment for HRS purposes. A buried/backfilled surface Impoundment is similar to a surface impoundment, only this source type has been filled with soil or other cover material after the final deposition of wastes.

Contaminated Soil: Contaminated soil can be distinguished by the method of deposition. Unlike other sources, contaminated soil is not intended to be a waste management unit and is often formed by migration, deposition, or spills of wastes.

However, consider these important points before associating hazardous substances with a source:

- An observed release to the migration pathways can be shown by sampling or by direct observation (e.g., if sampling finds hazardous substances in a ground water plume associated with a landfill, the hazardous substances can be associated with the landfill).

- Transformation products from a hazardous substance associated with a source can be scored only if sampling indicates they are present.

- Comparison to background is not necessary to establish the presence of hazardous substances for sources confirmed by manifests (e.g., RCRA, DOT).

- Visual observation of stained soils may be a clue to the presence of hazardous substances, but their presence must be verified through sampling or other means.

There are significant differences between the three migration pathways (ground water, surface water, and air) and the soil exposure pathway for associating hazardous substances with sources. The differences are highlighted below.

For the migration pathways:

- Consider those hazardous substances documented to be present in a source or known to be deposited in that source (e.g., by sampling, labels, manifests, oral or written statements) or in releases from the source to be associated with that source when evaluating each pathway.

- When a hazardous substance can be determined to be present at a site (e.g., by labels, manifests, oral or written statements, observed release), but the specific source cannot be documented, consider the hazardous substance to be present at all the sources, except those for which definitive information indicates that the hazardous substance was not or could not be present.

For the soil exposure pathway:

- Consider only the hazardous substances that meet the criteria for observed contamination for an area of observed contamination to be present in that area of observed contamination.

(4) **Evaluate the containment for each source.** Only hazardous substances associated with a source with a containment greater than zero or with an area of observed contamination are available to the pathway under consideration. Acceptable means of documenting hazardous substances available to the migration pathways and the soil exposure pathway are listed below.

- For the migration pathways, the hazardous substances (including any transformation products) available to a particular pathway are those that:

  — Meet the criteria for an observed release to the pathway under consideration; or

  — Are associated with a source with a containment factor greater than zero for the pathway under consideration (see Sections 7.4 and 8.5).

- For the soil exposure pathway, the hazardous substances available are those that:
  - — Meet the criteria for observed contamination at the site; or
  - — Meet the criteria for observed contamination at areas with an attractiveness/accessibility factor greater than zero, for the nearby population threat (see Section 9.8).

(5) **Calculate hazardous waste quantity.** After identifying the sources and determining the hazardous substances available to each pathway, calculate the hazardous waste quantity. For guidance on calculating the hazardous waste quantity, see Chapter 6 of this document.

EVALUATING SITES WITH NO IDENTIFIED SOURCES

Occasionally, sites that consist of a plume of contaminated ground water or an area of surface water sediment contamination, with the original source of the contamination unidentified, enter the Superfund process. Before scoring such sites, efforts should be undertaken to identify the original source(s) of contamination. These efforts should be equivalent to those of an expanded SI and should include:

- Research on site history and regulatory status;
- Site reconnaissance;
- Consideration of hazardous substances affiliated with industries of potential concern at the site;
- Records search and interviews with employees; and
- Sampling to eliminate or confirm other possible sources.

A source should generally not be designated as “unidentified" until sampling has been undertaken in an area and a search for the original sources has been conducted (within the scope of an expanded SI).

If the original source(s) of contamination cannot be identified, evaluate the ground water plume or the sediment contamination as the source for scoring purposes. In order for a ground water plume or sediment contamination to be characterized as a source, generally consider the following:

- The plume or sediment contamination has been established solely by sampling and inference, using the observed release criteria; and
- The level of effort to identify the original source is similar to an expanded SI.

CHARACTERIZING UNIQUE SOURCES

Some sources do not easily fit into HRS source types. These sources should be evaluated on a case-by-case basis. The unique sources described below do not comprise a complete list.

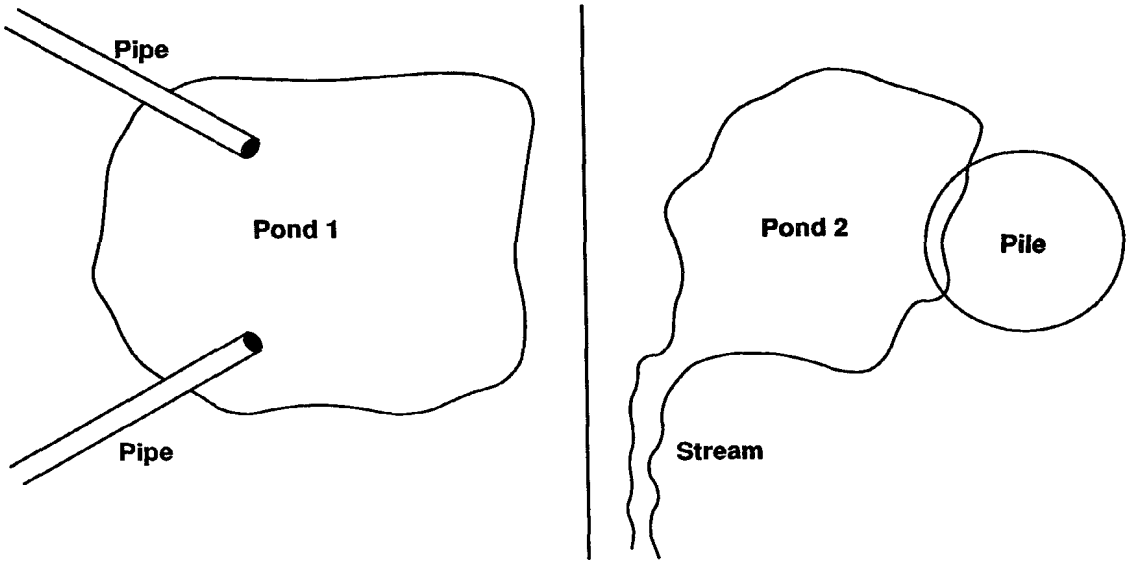
NATURAL PONDS

A natural pond used as a surface impoundment into which one or more hazardous substances were deposited can be considered a source in some circumstances. The following criteria provide guidelines for determining if a natural pond may be considered a source:

- The pond is an isolated water body (or has been modified so as to be an isolated water body).
- The entire pond is intended to be used as a waste management area.
- The hazardous substances in the pond result from deposition, as opposed to migration (see definition of source).

When a natural pond meets all of the above criteria, it may be considered a source and the assigned source type is usually surface impoundment. Water bodies such as rivers, oceans, or the Great Lakes should generally not be considered sources. ***Highlight 4-2*** shows two ponds, one that would be considered a source and another that would not.

HIGHLIGHT 4-2
WHEN TO CONSIDER NATURAL PONDS AS SOURCES



In this highlight, two ponds containing hazardous substances are shown. Pond 1 could be considered a source for HRS purposes. Pond 2, however, could not be considered a source, but rather is a contaminated surface water body in the surface water pathway. The reasons for this distinction are as follows:

- Pond 1 is essentially a closed system. Wastes in Pond 2 have the potential to migrate because the pond flows into a stream.
- The entire Pond 1 is intended for waste management as shown by the outfall pipes. No wastes are directly deposited into Pond 2.
- Wastes were deposited in Pond 1. Wastes migrated from the adjacent waste pile into Pond 2.
- Most importantly, Pond 1, although initially naturally occurring, was modified to manage wastes; Pond 2 was not.

INJECTION WELLS

Any documentation of direct deposition of a material that contains one or more hazardous substances into an injection well identifies it as a source. Such documentation can include (but is not limited to) manifests, permits, employee interviews, and sworn testimony. Injection wells are considered source type "other" for scoring purposes.

CONTAMINATED SEEPS AND LEACHATES

Because contaminated seeps and leachates arise from migration rather than from deposition, they should not be considered sources for the migration pathway. However, soils contaminated by seeps and leachates can be considered areas of observed contamination for the soil exposure pathway. If soil samples show observed contamination within two feet of the surface, consider the surface soil delineated by these samples to be an area of observed contamination.

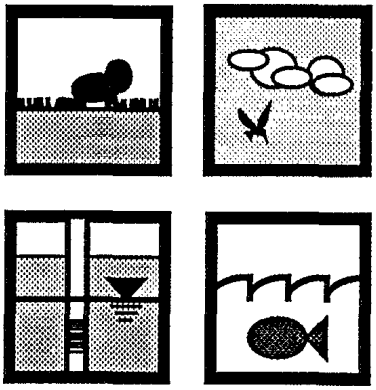
WALLS OR OTHER PARTS OF BUILDINGS CONTAINING HAZARDOUS SUBSTANCES

Walls or other parts of buildings can be considered sources subject to the restrictions in CERCLA concerning what constitutes a release (i.e., CERCLA section 101 (22), definition of release). Generally, the contamination of the building must be the result of activities within the building. The assigned source type is "other."

TIPS AND REMINDERS

- Sources must contain hazardous substances.
- Contaminated soil is considered a source for all three migration pathways, even if the soils have become contaminated by hazardous substance migration from another source type.
- Contaminated bayous are generally not considered surface impoundments; however, the contaminated sediments in a bayou may be classified as source type "other" if no other sources can be identified.
- Discuss qualitatively alleged or possible sources in the documentation record; however, only sources that can be described and documented should be used in scoring.
- Evaluate the documentation, other than sampling data, for sources with attention to the original purpose of the information. For instance, a letter giving permission for disposal of a hazardous substance in a landfill is generally not sufficient by itself to document that the substance was deposited.
- Manifests indicating deposition of hazardous substances are acceptable evidence of the presence of those hazardous substances in a source.
- Do not confuse "unidentified source" and "unallocated source." The unidentified source is used as a source type for ground water plumes or contaminated sediments when the original source of the contamination is unknown. The unallocated source is not actually a source, but rather is a means of evaluating hazardous waste quantity at sites where hazardous substances cannot be allocated to specific sources.

SECTION 4.2 OVERVIEW OF SITES WITH MULTIPLE SOURCES



The purpose of this section is to assist the scorer in deciding when to treat multiple areas containing hazardous substances as one source and when to treat these areas separately. This section defines multiple-source sites, orients the scorer to factor-specific considerations for HRS scoring, lists criteria necessary for source aggregation, and helps the scorer develop effective scoring strategies. If sources are similar in type and have similar target populations, the scorer should consider aggregating them into one source. Decisions to aggregate sources should be considered carefully because they may affect distance categories for some targets. This section does not address site aggregation issues.

DEFINITIONS

Site: Areas where a hazardous substance has been deposited, stored, disposed, or placed, or has otherwise come to be located. Such areas may include multiple sources and may include the area between sources.

Source: Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that may have become contaminated from hazardous substance migration. In general, however, the volumes of air, ground water, surface water, and surface water sediments that may have become contaminated through migration are not considered sources.

Source Aggregation: The treatment of two or more areas that could be considered individual sources as one discrete source. The area between two or more individual sources may or may not be considered part of the aggregated source.

SCORING MULTIPLE SOURCE SITES

The HRS establishes different procedures for scoring sites with single sources vs. multiple sources. Two types of HRS factors are affected.

- Factors for which the mechanism of scoring differs for single and multiple source sites are affected (***Highlights 4-3*** and ***4-4***). These are divided into two groups: (1) factors which are summed to obtain the score for multiple sources; and (2) factors in which a value is assigned to each source and the highest score for any one source is used for scoring; and

- Factors for which sources must meet specific criteria to be eligible for HRS scoring are affected (***Highlight 4-5***).

HIGHLIGHT 4-3
HRS FACTORS SUMMED FOR MULTIPLE SOURCES

When scoring the factors listed below for multiple sources, sum the values form all individual sources to obtain the factor value.

Section 2.4.2	Hazardous waste quality
Section 4.1.2.1.2.1.2	Runoff (surface water)
Sections 5.1.2.2 and 5.2.2.2	Hazardous waste quantity (soil exposure)

In addition, most targets factors (including the TDL, populations associated with distance categories, and sensitive environments) belong in this category.

HIGHLIGHT 4-4
HRS FACTORS SELECTED FROM INDIVIDUAL SOURCE FACTOR VALUES

When scoring factors (for pathways and threats) at sites with multiple sources, determine the factor values listed below for each individual source and then select the highest factor value for any one source as the pathway (or threat) factor value.

Section 3.1.2.1	Containment (ground water)
Section 4.1.2.1.2.1.1	Containment (surface water)
Section 4.1.2.1.2.2	Potential to release by flood (surface water)
Section 5.2.1.1	Attractiveness/accessibility (soil exposure)
Section 6.1.2	Potential to release (air)
Section 6.1.2.1.4	Calculation of gas potential to release value (air)
Section 6.1.2.2.4	Calculation of particulate potential to release value (air)

HIGHLIGHT 4-5
HRS FACTORS AFFECTED BY MINIMUM SIZE REQUIREMENTS

A few HRS factors are affected by the minimum size requirement. For such factors, the scorer should consider only those sources with a hazardous waste quantity factor value of 0.5 or more. However, if no sources meet the minimum size requirement, evaluate each source for the factors listed below. At sites with only one source, evaluate the source regardless of its hazardous waste quantity factor.

Section 3.1.2.1	Containment (ground water)
Section 4.1.2.1.2.1.1	Containment (surface water)
Section 4.1.2.1.2.2.3	Calculation of factor value for potential to release by flood (surface water)
Section 6.1.2.1.2	Gas source type (air)
Section 6.1.2.2.2	Particulate source type air

AGGREGATING SOURCES

Source aggregation refers to documenting two or more areas that could be considered individual sources as one discrete source when evaluating one or more pathways. ***Highlight 4-6*** provides criteria necessary to consider before aggregating sources. Sources may be aggregated in one pathway and treated separately in another pathway, based on the criteria listed in ***Highlight 4-6***. In general, it is advantageous to aggregate sources where possible because this should limit the number of separate sources evaluated without generally changing the overall site score.

The criteria in ***Highlight 4-6*** are appropriate for use when the sources under consideration are spatially separated from each other. When two sources overlap, consider site-specific information about the nature of the disposal operation, the hazardous substances found in the overlapping sources, and the containment characteristics of the sources in determining what sources should be aggregated. ***Highlights 4-7*** and ***4-8*** illustrate when to consider potential sources that apparently overlap as one source or two sources.

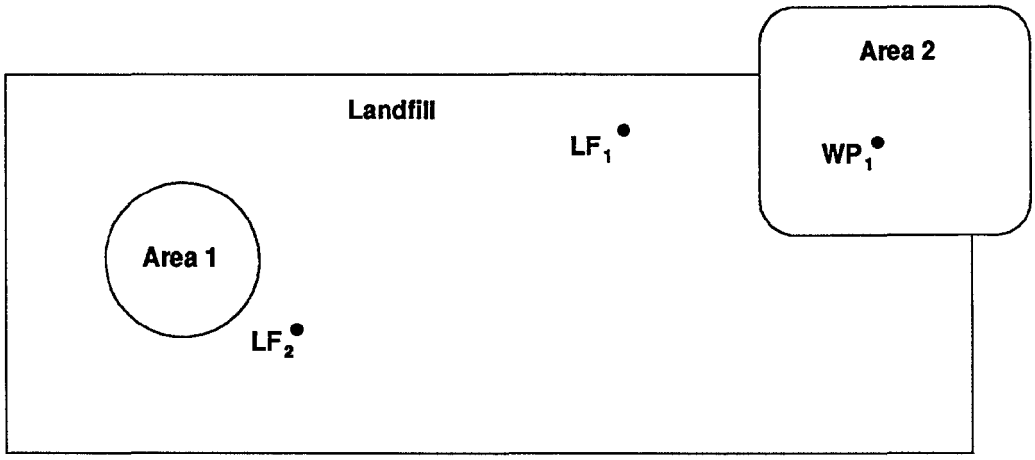
HIGHLIGHT 4-6
CHECKLIST FOR SOURCE AGGREGATION

Questions on this checklist should be used to determine whether to aggregate two or more sources for <u>each</u> pathway being evaluated.

(1)	Can the sources be classified as the same source type for the pathway? (e.g., drums, landfills, piles)	Yes	No
(2)	Do the sources affect similar target populations for the pathway? (i.e., target populations significantly overlap)	Yes	No
(3)	Do the sources have similar containment for the pathway? (e.g., liner, run-on and runoff controls, cover)	Yes	No
(4)	Do the sources contain substances with similar waste characteristics factor values available to the pathway? (e.g., toxicity, persistence mobility)	Yes	No
(5)	Are the sources in the same watershed and floodplain? (surface water only)	Yes	No
(6)	Are the sources overlying the same aquifer system(s)? (ground water only)	Yes	No

If the answer to each of these questions is “Yes” then the sources should be aggregated and treated as one source for the pathway. If the answer is “No” to one or more of these questions, then the sources should be treated separately for the pathway.

HIGHLIGHT 4-7
WHEN TO AGGREGATE OVERLAPPING SOURCES



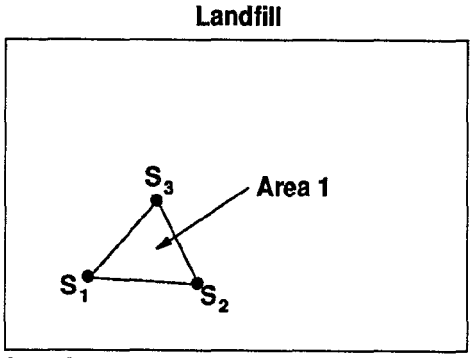
LF_x = Sampling point in landfill
WP_x = Sampling point in waste pile

- In assessing overlapping sources, consider site-specific disposal operations, hazardous substances found in the overlapping sources, and containment characteristics of the sources.
- In this example, two hazardous wastestreams (Areas 1 and 2) overlap within a closed landfill. Drums containing hazardous substances had been deposited in part of the landfill (Area 1) and tailings had been piled on top of the landfill (Area 2) after it closed.
- Sampling data show the following constituents exceed background:

  WP_1 = Arsenic, lead
  LF_1 = Arsenic, cadmium, mercury
  LF_2 = Arsenic, mercury, toluene

  Additionally, manifests indicate that drums containing benzene had been deposited in Area 1.
- The buried drums are a wastestream deposited in the landfill. These drums should not be considered a separate source.
- Consider Area 2 a separate source because the waste pile was deposited after the landfill was closed, and because the containment factors would score significantly different in selected pathways (e.g., air).

HIGHLIGHT 4-8
WHEN TO AGGREGATE CONTAMINATED SOIL WITH OTHER SOURCES



S_x = Sample point indicating contaminated surficial soils

Figure 1

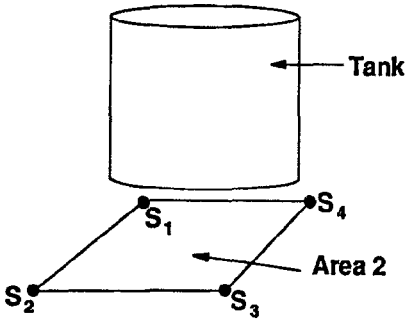


Figure 2

S_x = Sampling point indicating contaminated surficial soils

- In Figure 1, contaminated soil (Area 1) is covering a landfill. Determine if this is one source or two sources.
- If the hazardous substances found in surficial soil samples are also found in deeper samples in the landfill, the source is simply a landfill.
- If the hazardous substances found in surficial soil are not found in deeper samples, then consider this two sources -- contaminated soil and a landfill.
- In Figure 2, a leaking tank overlies an area of observed contamination (Area 2). Two sources would be present -- the tank and contaminated soil.

TIPS AND REMINDERS

- Score all sources that may significantly affect site score. In particular, consider possible changes to waste quantity, contaminant characteristics, or targets if the source is evaluated.

- Consider aggregating sources if they are the same source type and have similar characteristics (e.g., containment, proximity of units, target location, and hazardous substances associated with the units). Source aggregation for multiple-source units can change from pathway to pathway.

- For ground water, air, and soil exposure pathways, two strategies may be used to evaluate the applicable TDL and targets for multiple sources:

  S Targets can be the sum of the targets that fall into the distance categories around each individual source. This method is most appropriate when evaluating multiple sources that are large or far apart (i.e., distance categories drawn around each source do not overlap extensively).

  S Targets can be determined based on a single source that gives the highest targets factor category value. This method is appropriate for sites where considering multiple sources will not significantly affect the score.

- In the ground water migration pathway, it may be more efficient to measure the distance from each target well (if there are few) to the nearest source (if there are multiple sources) than to draw distance categories.

- For sources that are in the same watershed but have multiple PPEs to a watershed, the TDL should generally include the distance from the most upstream PPE to 15 miles from the most downstream PPE.

- For sources that have PPEs to different surface water bodies in the same watershed, determine the TDL from each PPE. The TDL for the watershed includes all in-water segments from these PPEs to the point where the water bodies merge plus the longest downstream distance as determined from each PPE.

- If sources are in different watersheds, score each watershed separately, and use the highest scoring watershed to score the pathway.